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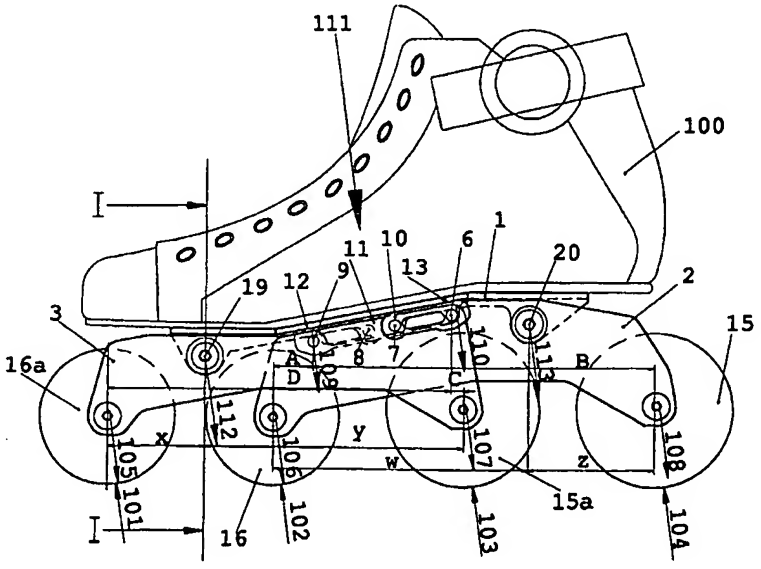
(54) Title: HOCKEY LIKE ROLLER SKATE



(57) Abstract

Roller skate comprising, a base plate (1), a rear wheel casing (2) and a front wheel casing (3), the casings (2, 3) being independently pivoted to the base plate (1), in each casing at least two wheels (15, 16 and 15a, 16a) are rotationally mounted and resilient members (10, 11) mounted between the base plate (1) and the wheel casings (2, 3) wherein a second wheel (16) and a fourth wheel (15) is mounted in the rear wheel casing (2) and a first wheel (16a) and a third wheel (15a) is mounted in the front wheel casing (3).

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HOCKEY LIKE ROLLER SKATE

TECHNICAL FIELD:

The present invention relates to roller skates, of which the wheel basis length can be changed during use, offering a short wheel base during situations where manoeuvring is required and a long wheel basis at higher linear speeds. The operating characteristics of these roller skates closely resemble those of ice-hockey skates with curved edged skating blades. The roller skate may be equipped with progressive working brakes.

BACKGROUND OF THE INVENTION:

Roller skates for agility sports, especially for roller-skating, are known for a long time, they require both speed and manoeuvrability during use. The high speed to cross the field requires a long wheel basis, while the turning, twisting and positioning requires a short wheel basis. The solutions used today are compromises, in which some of the required wheel basis length as well as some of the manoeuvrability is given up. Leading to designs which are either short with ground contact on all the wheels, or ones with a longer wheel basis in which the wheels do not all have ground contact at the same time.

Of all the known solutions of today, see for example WO 93/12846, whether technical viable or not, it can be said that; - their operating characteristics and possibilities hardly resemble those of ice hockey skates; - a fluent and natural change between the different motion like, positioning, twisting, field crossings at high speed, braking etc. is not possible.

OBJECT OF THE INVENTION:

The object of the invention is to avail, to every roller skater and especially the roller hockey skater, the possibility, to change the length of the wheel basis, to the length most appropriate for the situation he/she is in. While turning, twisting or positioning a short wheel basis can be used. While when covering longer distances a long wheel basis can be used. A

brake may be included. Thereby closely resembling the operational characteristics and possibilities one has with ice-hockey skates.

SUMMARY OF THE INVENTION:

The present invention comprises a base plate, preferably direct attached to a skating shoe, to which a number of wheel casings are pivotally attached. The said wheel casings are also attached to the base plate over permanent elastic springs. Said springs keeps/returns the wheel casings in position and acts as dampers. In said wheel casings wheels are rotationally attached.

A rotational movement of the foot or lower leg around the ankle makes it possible to alternate between; the wheels of all wheel casings in ground contact or the wheels of the front or the back wheel casing in ground contact, thereby availing the wheel basis concurrent to the motion. A brake may be included.

The said purpose is fulfilled with a roller skate embodiment within the scope of the present claims.

BRIEF DESCRIPTION OF THE DRAWINGS:

A detailed description of the invention will now be given with reference to the accompanying drawings of which:

Fig. 1 shows a three dimensional view of a roller skate with its wheels removed, with a flexible wheel basis length and damping.

Fig. 2 shows a side elevation of the device shown in fig. 1 with all wheels in ground contact.

Fig. 3 shows a side elevation of the device shown in fig. 1 with the second and fourth wheel of the roller skate in ground contact.

Fig. 4 shows a side elevation of the device shown in fig. 1 with the first and third wheel in ground contact.

Fig. 5 shows a cross section I-I over the hinge of the device shown in fig. 2.

Fig. 6 shows a side elevation of the device shown in fig. 1 equipped with a brake.

Fig. 7 shows a side elevation of the device shown in fig. 1 with an activated brake

DESCRIPTION OF THE INVENTION:

The embodiments hereafter described is showing a roller skate with a flexible adjustable wheel basis and shock absorbing system, which enables to adapt the length of the wheel basis to the activity at hand, being this either twisting, turning, positioning or covering long distances. The roller skates operation resembles the effect of ice-hockey skates with curved edged blades. The roller skates are usually fixed to shoes but can also be removable attached to shoes.

Fig. 1 shows the roller skate without the wheels with a base plate 1, integrated with the sole of a shoe 100 (See Fig. 2), in which the wheel casings, left side of rear wheel casing 2a, right side of rear wheel casing 2b and left side of front wheel casing 3a, right side of front wheel casing 3b are pivotal suspended in a front hinge 19 and a rear hinge 20. Each of the wheel casings 2, 3 contains two wheels 15, 16 and 15a, 16a (See Fig. 2) rotationally mounted by an axle bolt 14 to a bearing 17. The bearing 17 can accept radial as well as thrust forces and the axle bolt 14 forms after tightening a fixed unit with the wheel casings. A pre-tensioned spring 10 connects a pinion 6 fixed to the base plate 1, with a pinion 7, connected to the front wheel casing 3. A pre-tensioned spring 11 connects a pinion 8 fixed to the base plate 1, with a pinion 9 fixed to wheel casing 3 (See Fig. 2). The springs 10 and 11 are permanent elastic and form resistant, produced of a well vulcanised and stabilised rubber, EPDM saturated with peroxide and/or alternatives thereof. The springs have been pre-stressed and the initial elongation has been removed. The third wheel 15a and the fourth wheel 15 have a bigger diameter than the first wheel 16a and the second wheel 16 and this is possible while following the outline of the under side of the foot and because the configuration guarantees continuous ground contact, even if the wheels wear differently (See Fig. 2). The wheel casings are

connected by the hinge tube 18 (See Fig. 5) and by the axle bolts 14. The bearings 17 can absorb radial as well as trust forces and the tightening of axle bolt 14 cannot seize them up. The front and the rear hinges 18,19 are mounted by a rear axle screw 4 and a front axle screw 5.

Fig. 2 is showing the roller skate with the shoe 100 in a position representing the skating of longer distance. Vector 111 indicates the resulting force of both motion energy and body mass working on the roller skate. Vectors 109 and 110 signify the part of the force 111 transmitted to the permanent elastic cushions formed by the springs 10 and 11 between the base plate 1 and the pinions 6, 7, 8, 9 of the wheel casings 2 and 3 at the front buffer contact 12 and at the rear buffer contact 13. The cushioning effect created by the springs 10 and 11 will result in a vibration insulation and shock damping effect. Vectors 112 and 113 indicate the part of the force, indicated by the vector 111, directly delivered onto the hinge bolts mounted by the axle screws 4,5 of the wheel casings 2 and 3. At the wheels work, the resulting forces are represented by the vectors 105, 107 and 106, 108. The vectors 101, 103 and 102, 104 indicate the reaction forces to the force indicated by vector 111. The forces indicated by vectors 112 and 113 are divided over the wheels 16a, 15a and 16, 15 in an inverted relation to the lengths X - Y and Z - W. In order to equalise the forces indicated by the vectors 105, 107 and 106, 108, part of the force 111 is dispersed over the surfaces of the springs 10 and 11 by the base plate 1 at the buffer contacts 12, 13 resulting in the buffer forces indicated by the vectors 109 and 110. The forces indicated by the vectors 109 and 110 are divided over the wheels 16a, 15a and 16, 15 in an inverted relation to the lengths A - B and C - D. The relation A/B is larger than relation C/D, resulting in a better vibration insulation to the second (front) wheel 16, which has a smaller diameter and a more secure road contact than the fourth wheel 15. The third wheel 15a has because of its bigger diameter and mass all ready a higher vibration insulation and shock damping effect. The total of forces and their leverage creates an even distribution of forces over all the wheels in the shown position. Although this kind of skate is meant to be used on smooth surfaces, vibration

insulation and shock absorption is given as well as self adjustment of the wheel to uneven surfaces. Each wheel casing 2 and 3 forms a steady triangle with at its base the wheels 16a, 16 and 15a, 15 and at its top the hinges 19 and 20, which are mounted to the same base plate 1. Unevenness of the skating surfaces will be absorbed either by; - base plate 1 rotating around the hinges 19 or 20, - wheel casings 2 and 3 rotating around the hinges 19 or 20, - base plate 1 and wheel casings 2 and 3 rotating simultaneously around the hinges 19 and 20. The rotation inward of wheel 16 and 15a will compress the cushion part of the springs 10 and 11 between the base plate 1 at the buffer contacts 12, 13 and the pinions 6, 9, and thereby increasing the forces indicated by the vectors 112, 113 and concentrating surface contact on the wheels 16 and 15a.

Fig. 3 shows the roller skate with either the foot rotated around the ankle 135 or the lower leg placed diagonally in the direction of force indicated by the vector 115. Resembling a situation in which a forward or backward curve will be made, while having the centre of gravity back. The movement has caused the hinge 19 to lift, rotating the shoe 100 and the base plate 1 around the rear hinge 20. Pinion 7, which is attached to the base plate 1, will also rotate along, taking with it the pre-tensioned spring 10. Pinion 6, which is attached to the front wheel casing 3, will retain the spring 10 at buffer contact surface 13 under influence of the pre-tension of spring 10. Consequently the whole front wheel casing 3 and the therein attached wheels 16a and 15a will rotate together with the shoe 100 and the base plate 1 around the rear hinge 20. As soon as the rotational movement of base plate 1 starts, the contact of the spring 11 at buffer contact 12 will be reduced, in accordance with the expansion of the spring material between the pinion 9 and the surface 12 and very soon cease to exist. Thereby reducing the load indicated by the vector 117 on wheel 16 and subsequently increasing the load indicated by the vector 116 on the fourth wheel 15. During the rotation the base plate pinion 8 follows the base plate 1, to which it is attached, rotating the top part of the spring 11, while the bottom part stays on the pinion 9, which is attached to the wheel casing 2. The result is that pinion 8 will rotate around pinion 9 in a

widening spiral, thereby tensioning spring 11 further and create a growing force again reducing the effect of force indicated by the vector 117 and consequently increasing force indicated by the vector 116. The rotational movement around the rear hinge 20 is a gradual one progressively; - increasing the reaction force indicated by the vector 119 on the fourth wheel 15 and decreasing force reaction indicated by the vector 120 on wheel 16. Representing an impression and effect, as for example the curved edges of ice-hockey skates will give. Long and gradual curves will be effected by a slight rotation around the rear hinge 20 of the base plate 1, keeping enough resulting force at the second wheel 16 indicated by the vector 117 to steer with. Short and abrupt movements can be made by increasing the rotation around the rear hinge 20 of the base plate 1, reducing the resulting force at 117 and increasing force indicated by the vector 116, to such an extend that the second wheel 16 can slide in an horizontal circle around the fourth wheel 15. The increasing reaction force indicated by the vector 119 counter balances the growing movement of the mass force indicated by the vector 115 on the rear hinge 20 preventing toppling backwards. Since the counter force to be delivered by the spring 11 depends on body mass and driving style, it is important that it can be adapted to the individual.

Fig. 4 shows the roller skate with either the foot rotated around the ankle 135 or the lower leg placed diagonally in the direction of force indicated by the vector 121. Resembling a situation in which a forward or backward curve will be made, while having the centre of gravity fore. The movement has caused the hinge rear 20 to lift, rotating the shoe 100 and the base plate 1 around the front hinge 19. The pinion 8, which is attached to the base plate 1, will also rotate along. The pinion 9, which is attached to the wheel casing 2, will retain the spring 11 at buffer surface contact 12 under influence of the pre-tension of the spring 11. Consequently the whole rear wheel casing 2 and the therein attached wheels 16 and 15 will rotate together with the shoe 100 and the base plate 1 around the front hinge 19. As soon as the rotational movement of the base plate 1 starts, contact of spring 10 at surface 13 will be reduced, in accordance with the expansion of the spring material between

pinion 6 and surface 13 and very soon will cease to exist. Thereby reducing the load indicated by the vector 122 on wheel 15a and subsequently increasing the load indicated by the vector 123 at the first wheel 16a. During the rotation pinion 7 follows the base plate 1, to which it is attached, rotating the top part of the spring 10, while the bottom part of spring 10 stays on the pinion 6. The result is that the pinion 7 will rotate around the pinion 6 in a widening spiral, thereby tensioning the spring 10 further and create a growing force indicated by the vector 124, reducing the effect of the force indicated by the vector 122 and the increasing force indicated by the vector 123. The rotational movement around the front hinge 19 is a gradual one progressively; - increasing the force indicated by the vector 123 on the first wheel 16a and - decreasing the force indicated by the vector 122 on the third wheel 15a. Representing an impression and the effect as, for example, the curved edges of ice-hockey skates will give.

Long and gradual curves will be effected by a slight rotation of the base plate 1, keeping enough resulting force indicated by the vector 123 at the front wheel 16a to steer with. Short and abrupt movements can be made by increasing the rotation around the front hinge 19 of the base plate 1, reducing the resulting force indicated by the vector 122 at the third wheel 15a and increasing force indicated by the vector 123, to such an extent that the third wheel 15a can slide in an horizontal circle around the first wheel 16a. The increasing reaction force indicated by the vector 125 counter balances the movement of force indicated by the vector 121 on the front hinge 19 and prevents toppling forward. The counter force to be delivered by the spring 10 depends on body mass and driving style, and it is there fore important that it can be adapted to the individual.

Fig. 5 shows a sectional view taken along line I-I of Fig. 2. Shown are the two sides 3a and 3b of the wheel casing 3, they are firmly screwed together with a bolt/screw 4 and 5 onto hinge tube 18.

Hinge tube 18 is pivotally lodged in the base plate 1. There is a limited clearance between the sides of the wheel casing 2 and

the base plate 1 and both are preferably treated with a low friction coating. Shown are also the bearings 17, at the two different levels, which are not prone to seizing up when the fasteners in the form of an axle bolt 14 are tightened, in order to make a steady casing.

The skate previously described can preferably be equipped with a brake in which a longitudinal motion of a force transmitting member via a spring, forces a brake operating ring (35) with a cam to rotate and thereby axially force a disc brake towards the side of a roller skate wheel when the skater changes the foot or leg angle towards the skating surface.

Fig. 6 shows an operating mechanism for a brake, which can be installed on one or all wheel casings 2 and 3. A permanent elastic spring 30 connects; a pinion 28 on wheel casing 2, a pinion 29 mounted on a disc brake 27 and a pinion 31 on a cable shoe 36. The spring is permanent elastic and form fast, produced of well-vulcanised and stabilised rubber, - EPDM well saturated with peroxide and/or alternatives thereof. The spring has been pre-stressed and the initial elongation has taken place. The spring can be assembled by deformation of the original form. In the position showed in the figure, the spring 30 is drawn by both forces indicated by the vectors 127 and 128 which neutralise each other, keeping the pinion 29 of the disc brake 27 in its actual position and no braking is done. A spring guide 34 is rotationally connected to the rear wheel casing 2, while a cable shoe 33 is pivotally connected to the pinion 7 of the base plate 1. While the force indicated by the vector 128 is also working at the pinion 7 on base plate 1 by means of a cable 32, it may take over a part of or all of the functions of the spring 11 providing that a separate cushion at 12 is kept.

Fig. 7 shows the brake activated, The pinion 7 of the base plate 1 has pulled the cable shoe 33 and the cable 32 along during the rotation. The guide 34 on the rear wheel casing 2 has remained in place, resulting in a movement T of cable shoe 36 and pinion 31. The spring 30 when elongated becomes proportionally stronger between pinion 31 and 29 than between pinion 28 and 29. The pinion 29 has moved a distance S that is proportionally less

than the distance T. During the stroke of pinion 31 forward the pinion 29 follows along and thus transmitting this linear movement into a rotational movement of the brake operating ring 35 with its cam member (not showed) which when rotating makes the disc brake 27 being axially forced towards the wheel until it makes contact on the side of wheel 15. Most of the spring elongation has now taken place between the pinions 28 and 29. Once the brake has turned enough to activate itself, pinion 29 will stop and the expansion of the spring between the pinions 28 and 29 has come to an end. In order to get progressive braking the much stronger elongation/stress will now be concentrated between the pinions 29 and 31. The whole resulting in a progressive brake operation in which the brake action between the pinions 29 and 31 can be used to equalise pressure when the braking action is extended to more than one wheel. Now it is shown that part of the function of the spring 10 has been taken over by force indicated by the vector 129 pulling from pinion 28. The buffer functions are a function of spring 10 which has been overtaken by a cushion 22, which is fasted to the wheel casing 2 at a fastening 21.

CLAIMS:

1. Roller skate comprising, a base plate (1), a rear wheel casing (2) and a front wheel casing (3), the casings (2,3) being independently pivoted to the base plate (1), in each casing at least two wheels (15,16 and 15a,16a) are rotationally mounted and resilient members (10, 11) mounted between the base plate (1) and the wheel casings (2,3), characterised in that a second wheel (16) and a fourth wheel (15) is mounted in the rear wheel casing (2) and a first wheel (16a) and a third wheel (15a) is mounted in the front wheel casing (3). The position of casing 2 and 3 is controlled by resilient members 10 and 11.

2. Roller skate according to claim 1, characterised in that the front wheel casing (3) is pivotal attached to the base plate (1) over a front end located front hinge (19) and that the rear wheel casing (2) is pivotal attached to the base plate (1) over a rear end located rear hinge (20). Their unloaded position pre-destined over resilient members 10 and 11.

3. Roller skate according to any of the claims 1-2, characterised in that at least one wheel (15,15a,16,16a) is provided with a disc brake (27) arranged to axially engage the side of the wheel (15,15a,16,16a) when the brake (27) is being activated.

4. Roller skate according to any of the claims 1-3, characterised in that a force transmitting member (32) at one end is connected to the base plate (1) and at the other end connected to a spring (30), which spring (30) forces a brake operating ring (35) or a disc brake (27) to rotate and thereby axially force the disc brake (27) towards the side of the roller skate wheel when the skater changes the foot angle towards the skating surface.

5. Roller skate comprising, a base plate (1), resilient members (10, 11) and (30), disc-brake (27) engaging at least one wheel (16, 16a) on one side and wheel-casings (2, 3) in which at least two wheels (15, 15a - 16, 16a) are rotationally mounted.

characterised in that the wheel casings (2, 3) are, at one end, pivotal connected to base plate 1 over a hinge (19, 20).

6. Roller skate according to any of the claims 1-5, characterised in that an exchangeable resilient member (10, 11) is attached in between base plate (1) and the wheel casings (2, 3).

7. Roller skate according to any of the claims 1-6, characterised in that the resilient member (10, 11) keeps one of the wheel casings (2, 3) in place when the skate is lifted from the ground.

8. Roller skate according to any of the claims 1-7, characterised in that the resilient member (10, 11) serves as vibration insulator and shock damper between the surfaces (12, 13) of base the plate (1) and the wheel-casings (2, 3) at the pinions (6, 9).

9. Roller skate according to any of the claims 1-8, characterised in that the wheels (15, 15a - 16, 16a) all keep ground-contact as long as the force (111) resulting from body mass and motion energy is divided over the hinges (19, 20).

10. Roller skate according to any of the claims 1-9, characterised in that the wheels (15, 15a - 16, 16a) have different diameters.

11. Roller skate according to any of the claims 1-10, characterised in that the resilient member (10, 11) will force one of the wheel casings (2, 3) to follow the rotation of the base-plate (1) once its wheels (15, 15a - 16, 16a) are free from ground-contact.

12. Roller skate according to any of the claims 1-11, characterised in that the rotation of the base-plate (1) leaves only the wheels (15, 15a - 16, 16a) of one wheel casing (2, 3) in ground contact.

13. Roller skate according to any of the claims 1-12, characterised in that the resilient member (10, 11) reduces the force (117, 122) on the wheel (16, 15a) once base-plate (1) is rotated.

14. Roller skate according to any of the claims 1-13, characterised in that the resilient member (10, 11) increases the force (123, 116) on the wheel (15, 16a) once base plate (1) is rotated.

15. Roller skate according to any of the claims 1-14, characterised in that a rotationally operated disc-brake (27) can be installed to the wheels (15, 15a - 16, 16a).

16. Roller skate according to any of the claims 1-15, characterised in that a brake operating cable 32 and pre-tensioned spring (30) are installed between base plate (1) and wheel casing (2, 3).

17. Roller skate according to any of the claims 1-16, characterised in that a spring (30) is installed, which keeps the pinion (29) in neutral position, when none of the wheel casings (2, 3) is rotated.

18. Roller skate according to any of the claims 1-17, characterised in that a spring (30) is installed, with two different elongation-stress characteristics.

19. Roller skate according to any of the claims 1-18, characterised in that the spring (10, 11, 30) are adaptable to body weight and performance.

20. Roller skate according to any of the claims 1-19, characterised in that a spring function (10, 11) is taken over by another spring (30) and a cushion (22).

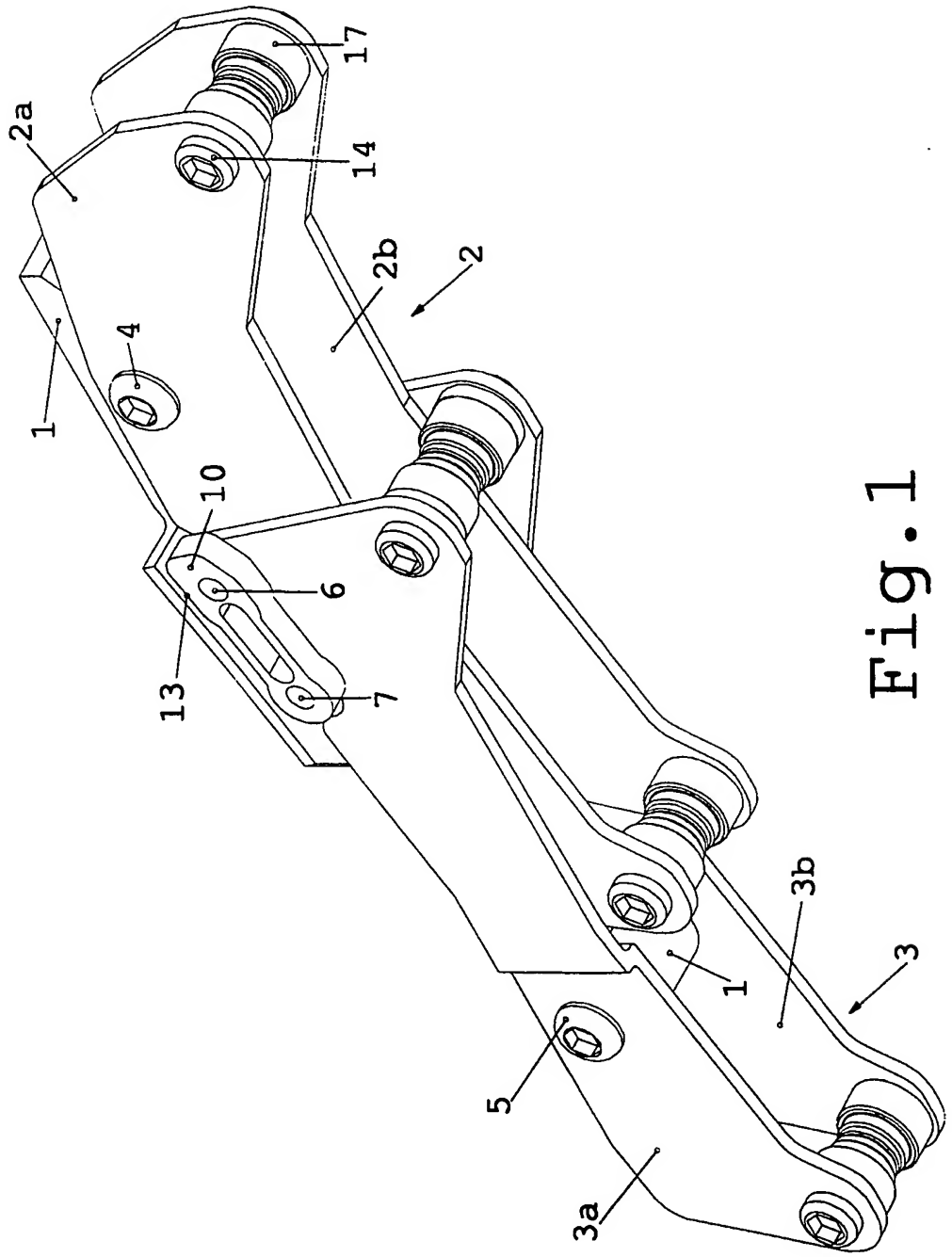
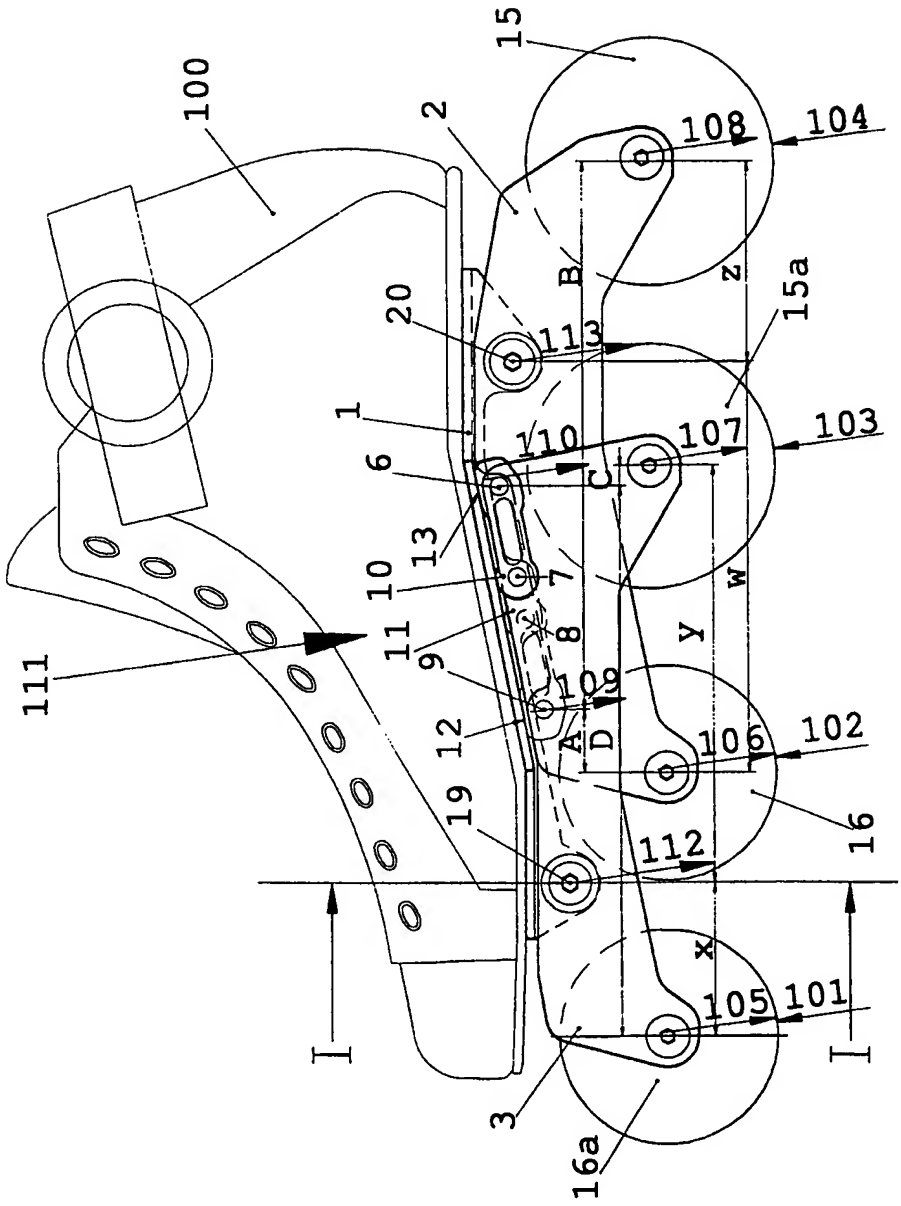


Fig.1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w
9
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FIG.2

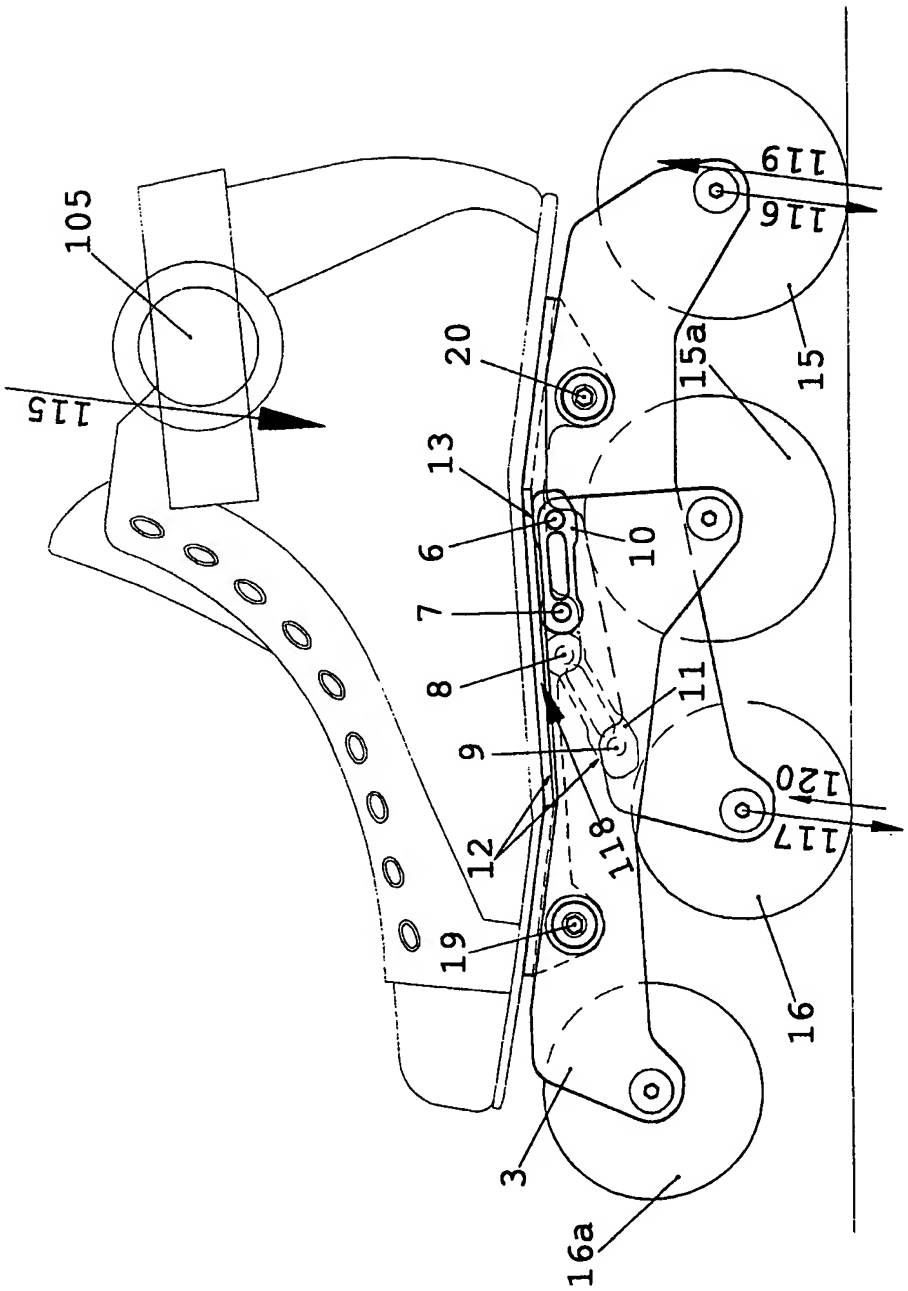

FIG. 3

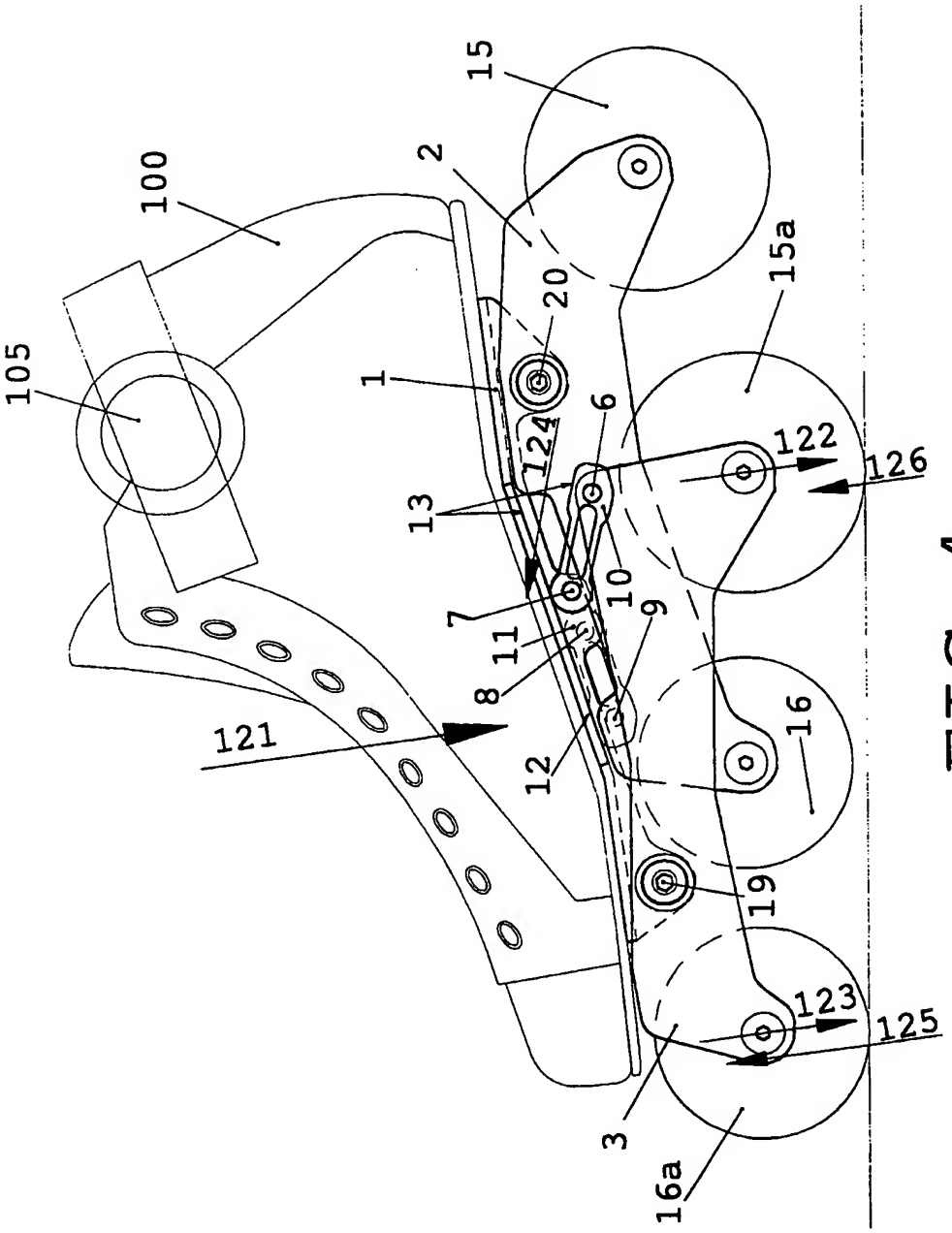
15
2
100
15a
20
105
1
6
124
122
126
13
10
7
9
11
8
121
12
16
19
123
125
3
16a

FIG. 4

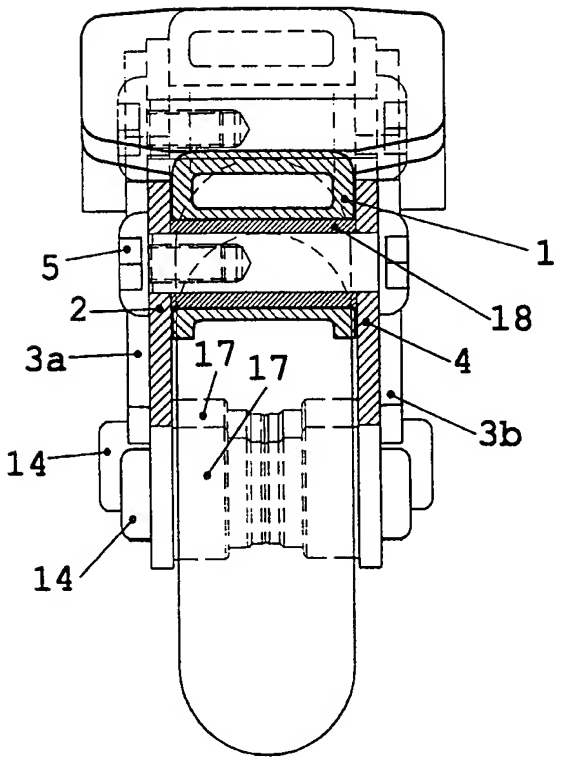

FIG.5

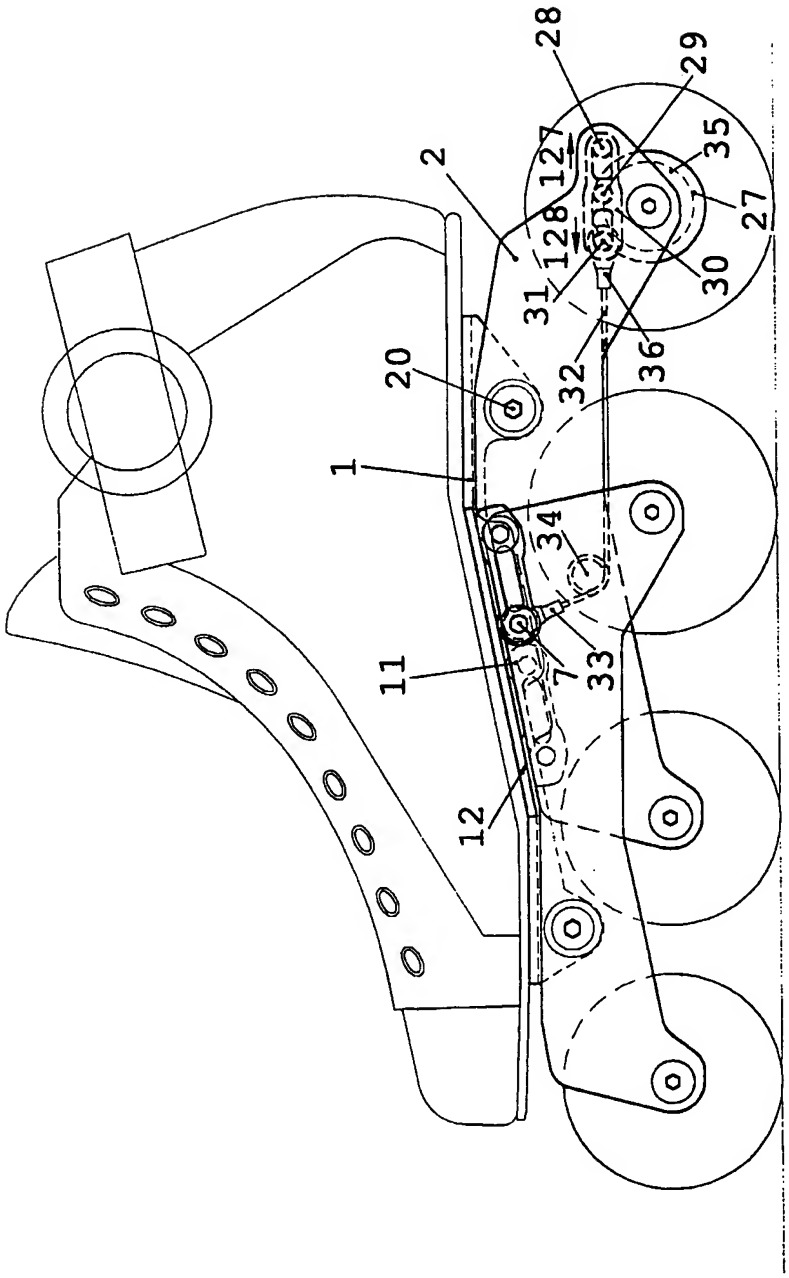

FIG.6

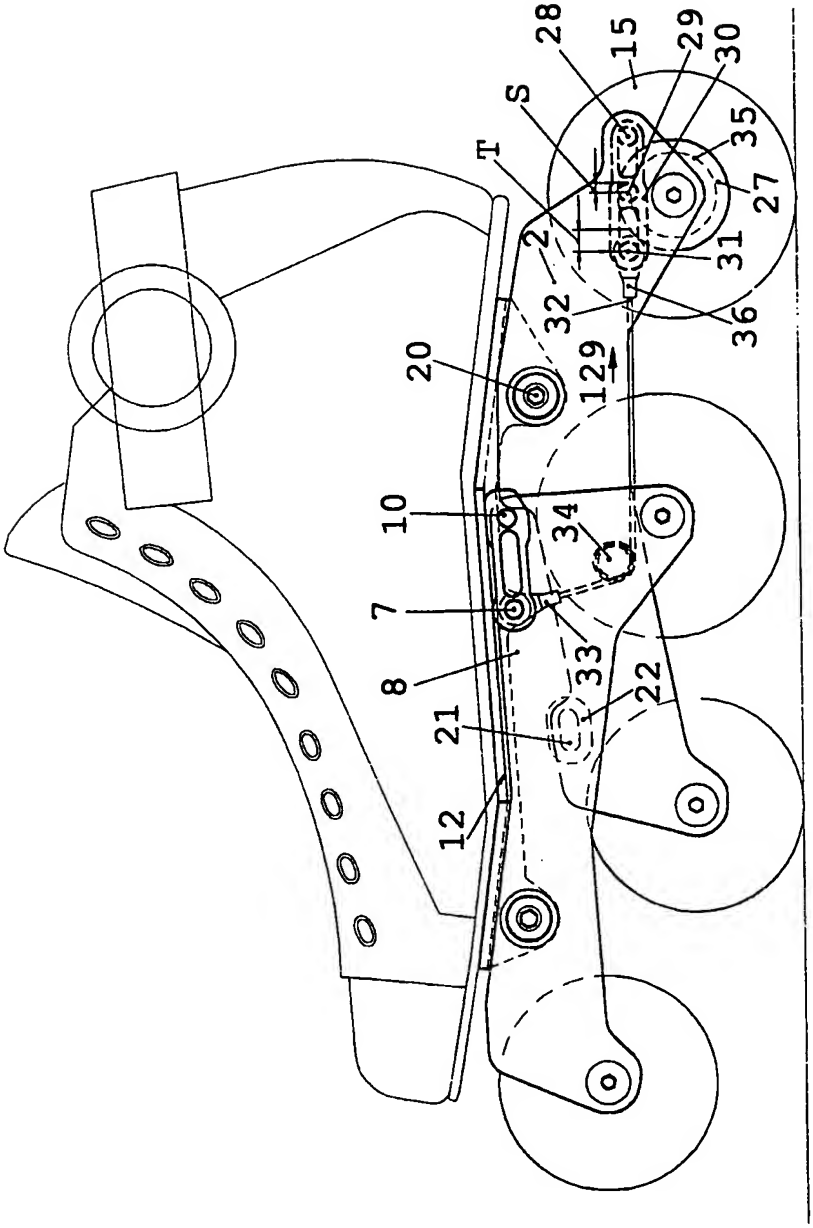

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/00030

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A63C 17/06
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A63C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2744373 A1 (SKIS ROSSIGNOL SA SOCIETE ANONYME), 8 August 1997 (08.08.97), page 4, line 7 - page 5, line 33; page 7, line 19 - page 8, line 15, figures 1,5	1,2,6-9
Y		3,5,10,15, 18-20
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X	EP 0795348 A1 (SKIS ROSSIGNOL S.A.), 17 Sept 1997 (17.09.97), column 3, line 53 - column 4, line 11, figure 4	1,2,6-9
Y		3,5,10,15, 18-20
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
22 April 1999	30 -04- 1999
Name and mailing address of the ISA Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Johan Löfstedt Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

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